

(12) UK Patent Application (19) GB (11) 2 168 105 A

(43) Application published 11 Jun 1986

(21) Application No **8530234**

(22) Date of filing **9 Dec 1985**

(30) Priority data

(31) **8431227**

(32) **11 Dec 1984**

(33) **GB**

(71) Applicant

**Josiah Parkes & Sons Limited (United Kingdom),
Union Works, Gower Street, Willenhall, West Midlands
WV13 1JX**

(72) Inventor

Raymond Worrall

(74) Agent and/or Address for Service

**R W Obee,
Manor House, Manor Lane, Feltham, Middx TW13 4JQ**

(51) INT CL⁴

E05B 63/14

(52) Domestic classification (Edition H):

**E2A 101 106 120 160 171 420 504 505 509 524 AK AR
U1S 1715 E2A**

(56) Documents cited

None

(58) Field of search

E2A

**Selected US specifications from IPC sub-classes E05B
E05C**

(54) Multi-point locks

(57) In a multi-point door-locking mechanism a handle (not shown) connected to a central locking unit 1 is coupled through drive bars 7 to throw and withdraw the bolts 6 comprised in remote locking units 2 and 3. In each remote unit the respective drive bar is connected to one end 31 of a crank member 30 which latter is pivoted at its other end 29 to another crank member 23. The crank member 23 is in turn borne to pivot about a fixed pin 24 and is coupled to the bolt 6 at its other end 26. To throw the bolt the drive bar pivots the crank member 30 clockwise, so also pivoting the crank member 23 clockwise through a smaller angle but a longer throw. In the thrown condition the member 30 attains an "overcentre" position such that the bolt 6 becomes effectively deadlocked against end pressure, irrespective of any deadlocking of the drive member 7 which may also be effected in the centre unit 1.

Fig.1.

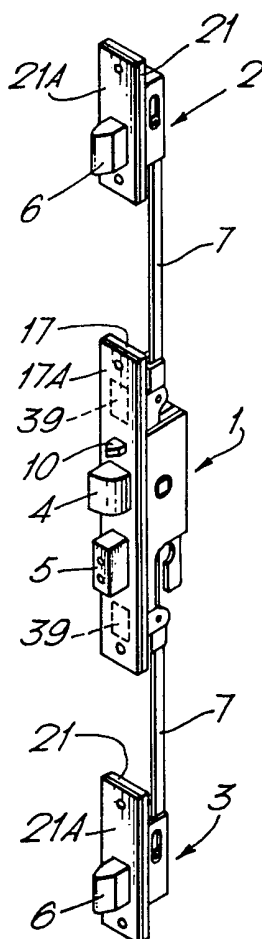
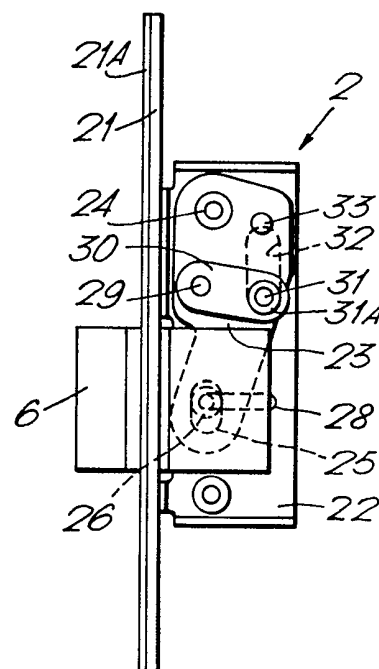


Fig.4B.



GB 2 168 105 A

Fig. 1.

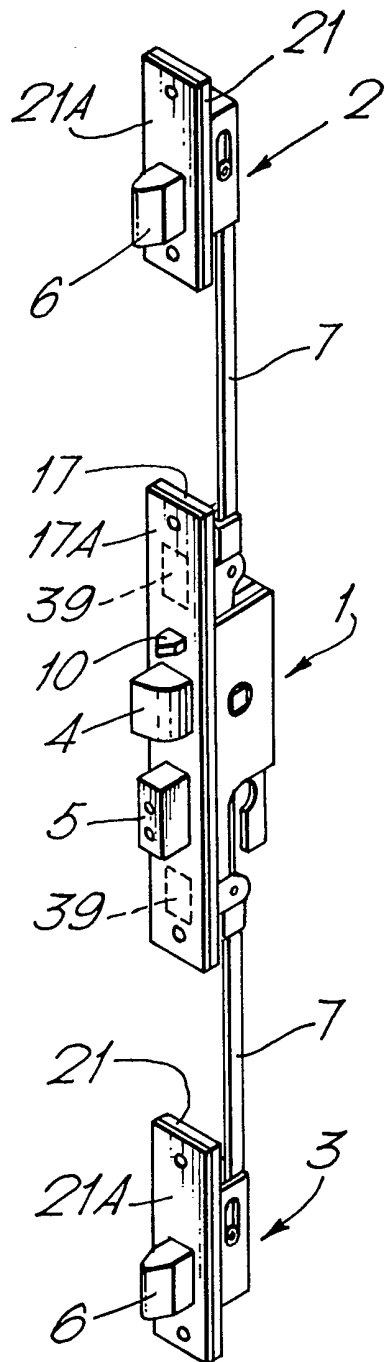


Fig. 2.

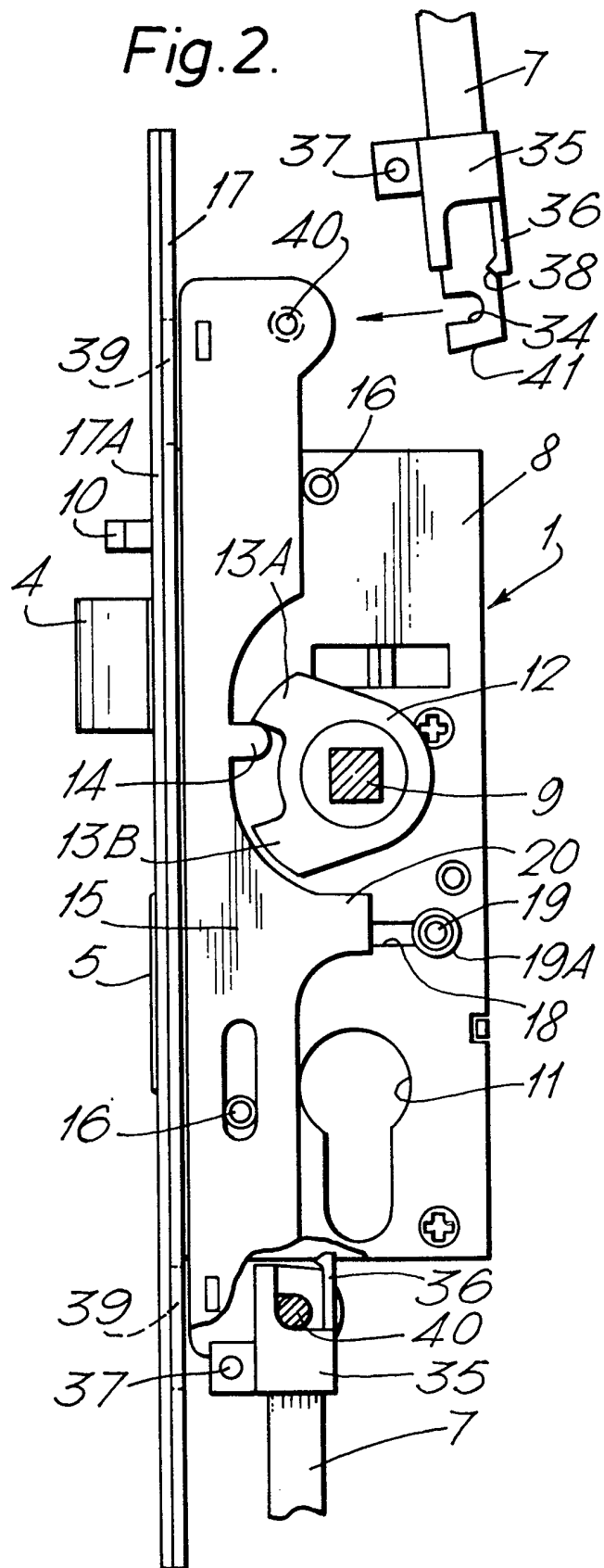


Fig.3A.

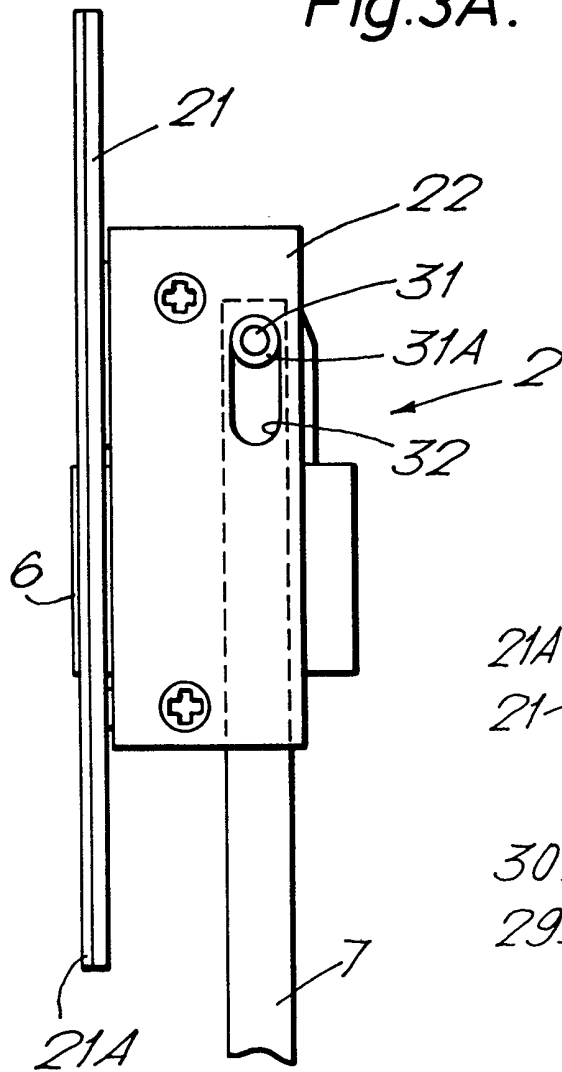


Fig.3B.

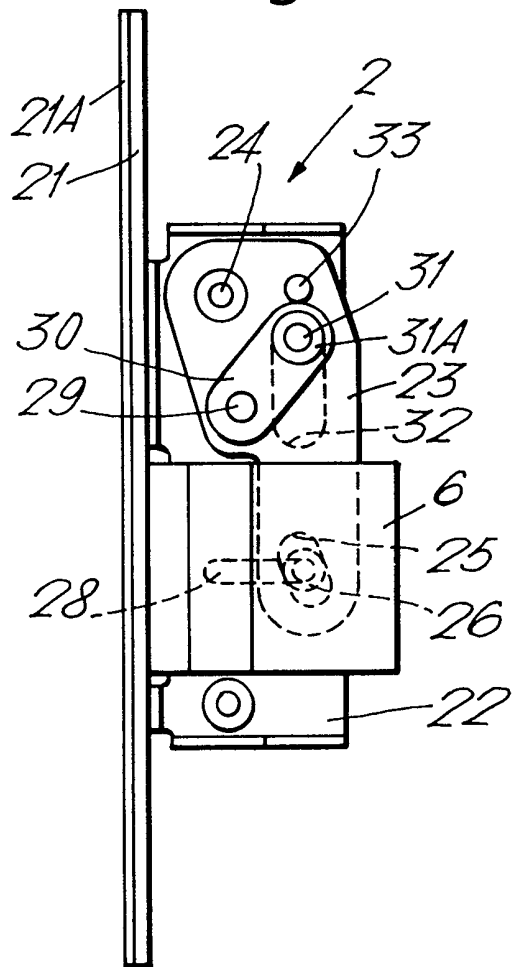


Fig. 4A.

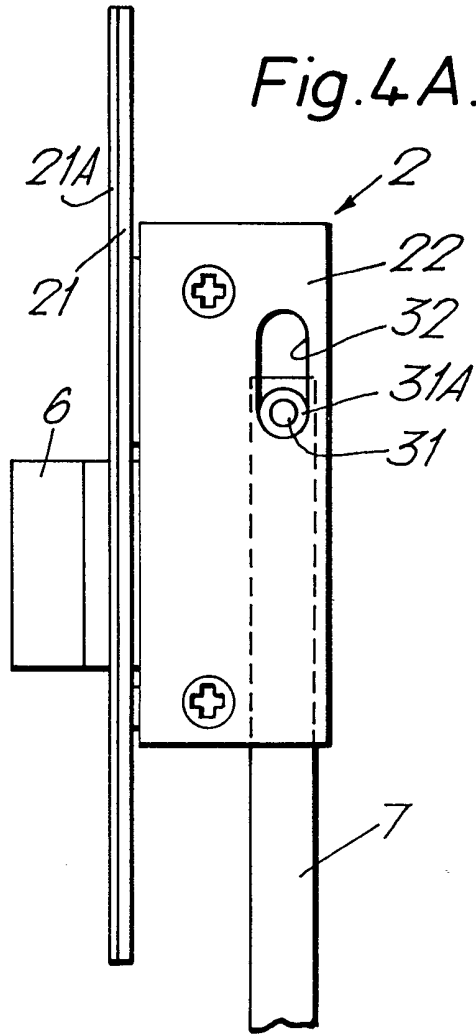


Fig. 4B.

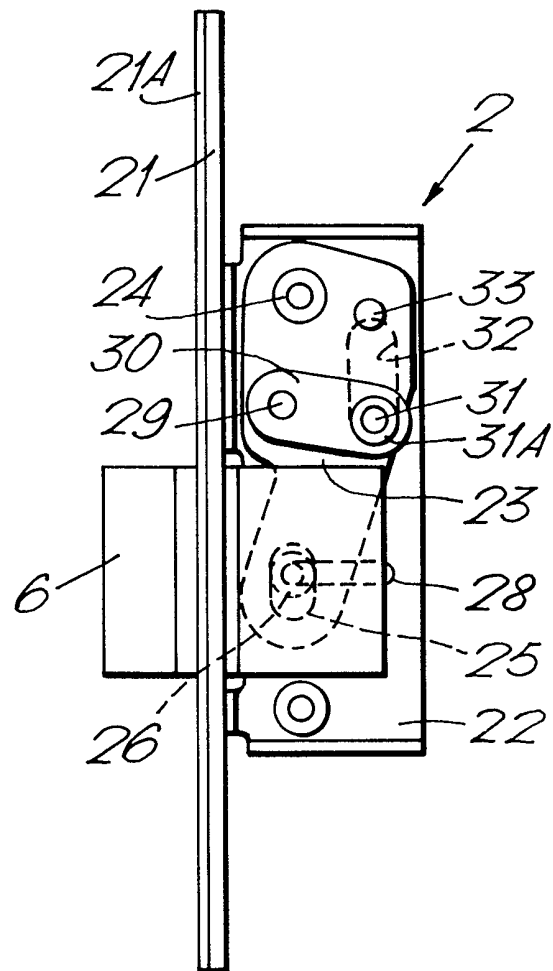
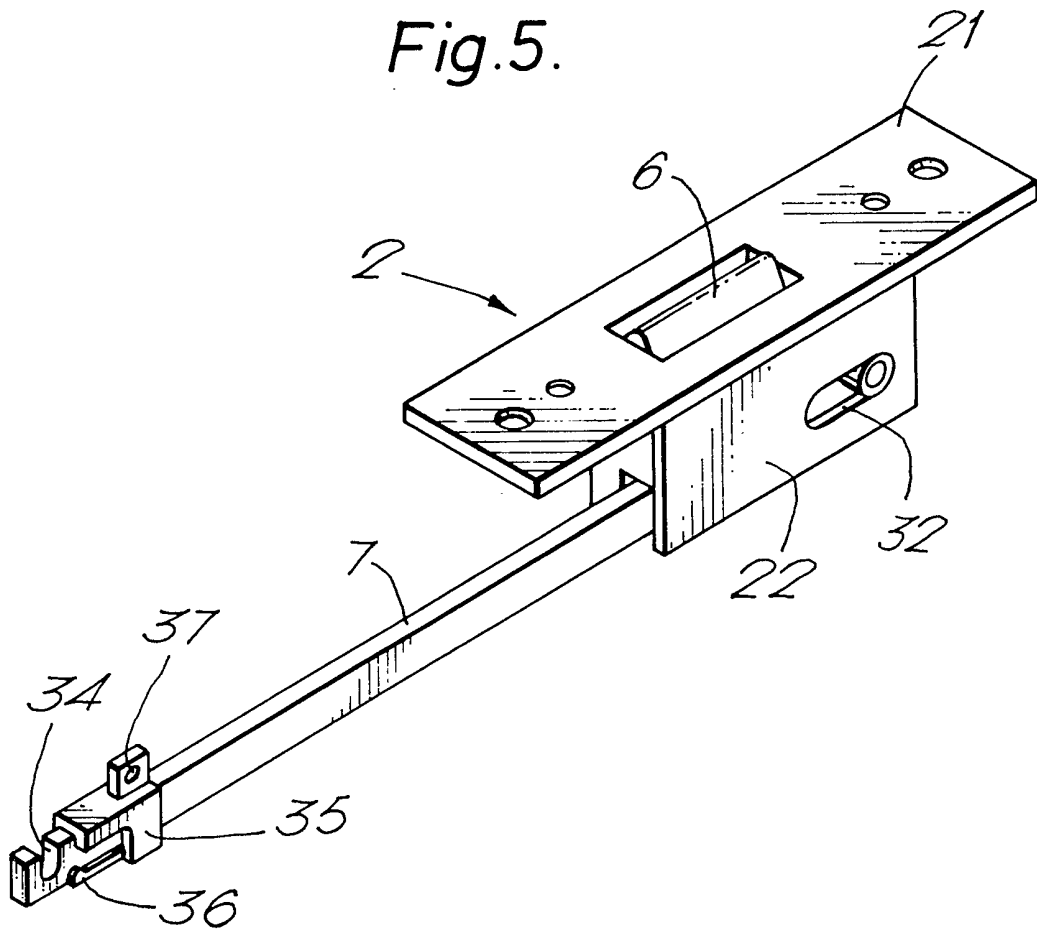


Fig.5.



SPECIFICATION

Multi-point locks

5 This invention relates to multi-point locks, by which we mean locks for doors or other closures in which a handle (or other such manipulable member) mounted to the closure at one location (and normally, though not exclusively, comprised within a locking or latching unit having at least one bolt operatively coupled to the handle and which is arranged to be thrown from the closure at that location), is operatively coupled to one or more bolts which are thrown from the closure at locations remote from the handle, so that in total the handle is arranged to control simultaneously the operation of at least two bolts at spaced-apart locations on the closure. Clearly, a lock of this nature can provide greater security against forcing than can a single conventional lock which throws a bolt (or bolts) from only one location on the closure, and is far more convenient in use than locking arrangements which employ a plurality of separately-operable spaced-apart bolts. The use of multi-point locks has become increasingly, and more generally, popular of late, particularly with aluminium door manufacturers, and some examples of recent multi-point locks are to be found in the published United Kingdom patent applications Nos 2051214, 2053340, 2101667, 2119007, 2119014, 2122244 and 2134170.

35 The present invention resides in various aspects of a multi-point lock to be more particularly exemplified hereinafter.

One important such aspect of the invention aims to provide for a multi-point lock which may be mounted within, or upon, a door stile so that the bolt(s) which are located remote from the handle project transversely from the stile when thrown, (as in, for example, UK Patent Applications 2051214, 2053340 and 45 2119007) and are effectively deadlocked against end pressure by means provided with the bolt(s) at the respective remote location(s), (that is to say in addition to the deadlocking action of any other locking mechanism which may be comprised in a unit together with the handle), but without significantly adding to the cost and complexity of the lock. Accordingly in this aspect the invention provides a multi-point lock in which a handle (or other such manipulable member) is coupled to at least one remotely-located bolt through a reciprocal drive member, said bolt being comprised within a unit including mechanism for transmitting movement of said drive member to the bolt so that, when thrown, the bolt projects transversely to the direction of the drive member, said mechanism including a pivotal member which, when said bolt is in its thrown position, lies in an "overcentre" position such that end pressure upon the bolt

tends to move that member further in the sense in which it moves when the bolt is being thrown, but such movement is limited by stop means. In this way the remotely-located bolt becomes effectively deadlocked against end pressure by virtue of the chosen geometry of the associated transmission mechanism.

70 In a particularly preferred embodiment of the above-defined aspect of the invention the remotely-located bolt is borne for reciprocation generally perpendicularly to said drive member and the said transmission mechanism comprises a first crank member borne at one end on a fixed pivot and coupled at its other end to the bolt, and a second crank member pivoted at one end to the first crank member and pivoted at its other end to said drive member, the second crank member being 85 placed in an "overcentre" position as aforesaid when the bolt is thrown. The geometry of such a mechanism can be chosen to achieve effective amplification of linear movement as between the drive member and bolt, so as to provide an advantageously long bolt throw without requiring excessive travel of the handle, while at the same time keeping the centre-to-centre distances of the two crank members within close limits so that the whole said transmission mechanism can be embodied in a compact unit suitable for mounting within, for example, the narrow stiles of aluminium doors.

In another aspect the invention is concerned with a problem exhibited by known multi-point locks when fitted within the box section of an aluminium door stile, or a similar structure. With known multi-point locks, the assembly procedure requires that access be provided for, or to, components of the lock through the head or sill end of the stile and/or through its reverse face (that is, the face adjacent to the glazed or other panelling of the door). In general this means that at least the major components of the lock must be fitted to the stile before the latter is finally assembled with the rest of the door. Retrofitting of the locks to existing doors is therefore made difficult; furthermore, if an existing lock needs to be removed, for servicing, repair or replacement for example, the door must be at least partially disassembled before this task can be achieved. These problems appear to be particularly acute with locks of the kind where a plurality of bolts are arranged to be thrown through the front face of the stile.

In light of the foregoing, the present invention also resides in a multi-point lock comprising a first unit adapted to be received within the stile of a door through an aperture in the front face thereof, and having a forend by which that unit can be fixed to such a face; said unit including an input member adapted to be operatively coupled to a handle (or other such manipulable member) and an output

member operatively coupled to the input member; and a second unit adapted to be received within the stile of a door through an aperture in the front face thereof at a location remote from the first unit; said second unit including a bolt and an elongate drive member therefor extending away from the location of said bolt and adapted to be operatively coupled at its free end to said output member of the first unit; and the aforesaid forend having an aperture through which access can be gained to the free end of said drive member, when the first and second units are received as aforesaid, for coupling the same to said output member.

These and other aspects of the present invention will now be more particularly described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is an isometric view of a complete multi-point lock in accordance with the invention;

Figure 2 is a side view of the central unit of the lock with a cover plate removed;

Figure 3A is a side view of an end unit of the lock with its bolt retracted and *Fig. 3B* is a similar view with the cover plate and drive bar removed;

Figure 4A is a side view of the end unit with its bolt thrown and *Fig. 4B* is a similar view with the cover plate and drive bar removed; and

Figure 5 is an isometric view of the complete end unit.

The multi-point lock shown in *Fig. 1* consists essentially of a central unit 1 and upper and lower end units 2 and 3, each intended for installation mortice-wise into the hollow stile of an aluminium door. The central unit 1 (seen also in *Fig. 2*) comprises a lock of generally conventional kind having a spring bolt 4 and dead bolt 5. Each end unit 2 and 3 has a dead bolt 6 the movements of which are controlled from the central unit 1 via respective drive bars 7.

Fig. 2 shows the central unit 1 with an outer cover plate removed. Within the main casing 8 of this unit is a mechanism of known kind for withdrawing the spring bolt 4 in response to the turning of a spindle 9 by means of an associated handle (not shown) on each side of the door, and for automatically deadlocking the spring bolt 4 against end pressure when the door is closed, in response to the actuation of a snib 10, and known mechanism for throwing and retracting the head bolt 5 in response to key-operation of a locking cylinder (not shown) intended for mounting in the aperture 11. Alternatively if a so-called "night-latch" action is required, the spindle 9 will be adapted in known manner to provide that the spring bolt 4 can be retracted by handle movement from the inside of the door only, retraction from the outside requiring key-operation.

As shown in *Fig. 2*, mounted to the spindle 9 outside the casing 8 is a follower 12. This follower has two ears 13A and 13B which can engage alternately with a central drive lug 14 on a plate 15 which is borne for vertical sliding movement on the outside of the casing 8 by means of a pair of pins 16 and the lock forend 17. At each end the plate 15 is connected, in a manner to be more fully described hereafter, to the respective drive bars 7 so that by sliding the plate 15 and bars 7 downwards the end unit bolts 6 are both thrown and by sliding the plate 15 and bars 7 upwards the end units bolts 6 are both retracted—by mechanisms in the end units which will also be more fully described hereafter. In order to throw the end unit bolts 6, therefore, the illustrated follower 12 is turned anti-clockwise (that is to say by lifting the associated handle) to drive the lug 14 downwards with the ear 13A, and to retract the end unit bolts 6 that follower 12 is turned clockwise (that is to say by depressing the associated handle) to drive the lug 14 upwards with ear 13B. The ears 13A/13B are spaced apart as shown to enable the handle to spring back to a central, horizontal position between each such movement. The assembly of follower 12 and plate 15 is duplicated on the side of the lock opposite to that seen in *Fig. 2* so that where a "nightlatch" action for the spring bolt 4 is provided as described above—which involves splitting the spindle 9 so that a drive connection is not established through the spindle between the two handles on the opposite sides of the door—throwing and retraction of the bolts 6 will occur by appropriate manipulation of either handle.

As seen in *Fig. 2*, the deadbolt 5 bears a lateral pin 19 which extends out through a slot 18 in the casing 8 and there carries a collar 19A. In the upper position of the plate 15 as shown in *Fig. 2*, which corresponds to the retracted position to the end unit bolts 6, the plate 15 lies in the path of the collar 19A and thereby blocks throwing of the deadbolt 5 until after the end bolts 6 have been thrown. Throwing the latter, however, by downward movement of the plate 15, frees the deadbolt 5, and when that bolt has been thrown by appropriate key-operation the collar 19A overlies a tongue 20 on the plate 15 to block upward movement of the same—and thereby retraction of the bolts 6—until after the bolt 5 has been retracted again with the key.

Turning now to *Figs. 3* and *4*, these shown the construction and operation of the upper end unit 2. The structure includes a forend 21 and casing 22 within which the reciprocable bolt 6 is borne. A crank 23 is pivoted at one end on a fixed pin 24 in the casing. At its over end the crank 23 has a slot 25 within which is received a shouldered stump 26 extending laterally from the tail of the bolt 6. The end of this stump engages in a horizontal

guide slot 28 in the base plate of the casing 22. Intermediate the pivot 24 and slot 25 the crank 23 carries a pin 29 upon which one end of a toggle link 30 is pivoted. At its other end

- 5 the link 30 carries a pin 31 which passes through an eye at the top end of the associated drive bar 7 and bears at its end a roller 31A which lies in a vertical guide slot 32 in the cover plate of the casing 22.
- 10 The operation of unit 2 is as follows. Assuming that the bolt 6 is in its retracted position as shown in Fig. 3, lowering the drive bar 7 pulls the pin and roller 31/31A from the upper to the lower end of the slot 32, thereby
- 15 pivoting the toggle link 30 clockwise about pin 29 from the position shown in Fig. 3B to that of Fig. 4B. The link 30 in turn pivots the crank 23 clockwise about the pin 24 from its Fig. 3B to its Fig. 4B position, thereby throwing the bolt 6 through the slot and stump connection 25/26. To withdraw the bolt the drive bar 7 is raised once more, thereby reversing the above-described movements; preferably, an additional peg is provided on the surface of the crank 23, as shown at 33, with which the link 30 abuts towards the top of its up-stroke to assist in driving back the crank and ensure positive bolt withdrawal. The structure and operation of the lower end unit
- 30 3 is identical to that of the above-described unit 2, except that the corresponding drive bar 7 links to the respective toggle 30 from above rather than from below.

- The double-crank mechanism provided by the elements 23 and 30 in the end units enables a useful amplification of linear movement to be achieved as between the drive bars 7 and bolts 6, while at the same time keeping the overall size of the mechanism within compact limits. Furthermore it will be noted that when the bolt 6 is thrown the corresponding link 30 moves to a position which is "overcentre" in relation to end pressure on the bolt (that is to say to any external force applied to the bolt head tending to retract it). The tendency of any end pressure on the bolt is thus to apply a clockwise turning moment to the link 30, which is resisted however by the abutment of the roller 31A against the lower end of the slot 32. The geometry of the drive mechanism within the end units is therefore such as automatically to deadlock the bolts 6 against end pressure whenever thrown. From the point of view of the security of the locked
- 55 installation this action provides a useful reinforcement to the blocking action of the deadbolt 5 on the slides 15 described above. However, it is also particularly useful when the bolts 6 are employed to perform a weather sealing function and are therefore liable to be loaded axially whenever thrown, in conditions when the deadbolt 5 is not operated.

- To explain, as most clearly shown in Figs. 1 and 5 the head of each bolt 6 is chamfered
- 65 on each flank. The intention in this respect is

- that when these bolts are thrown the chamfered flank furthest from the door frame rebate will engage an edge of an associated striker plate (not shown) and urge the door against the rebate at top and bottom, to eliminate draughts and correct any door warpage. The reaction of the striker on the chamfered bolt may, however, tend to cam the bolt back into its casing in the absence of a positive
- 70 block on such movement. Bearing in mind that a user may not need, or wish, to have the deadbolt 5 thrown for much of the time, the "overcentre" deadlocking action within the units 2 and 3 conveniently overcomes any problem of bolt retraction under pressure from the striker. Whilst only one flank of each bolt 6 in any installation is required to be chamfered to perform this weather sealing function, both flanks are chamfered so that the same components are suitable for installation in either
- 85 "hand".

- Description will now be directed to the assembly procedure for the illustrated multipoint lock when installed in the hollow stile of an aluminium door or the like.
- 90

- Firstly, the central unit 1, unconnected to the drive bars 7 and minus the spindle 9, locking cylinder and any fascia plate (such as item 17A shown in Fig. 2), is passed through an appropriately-sized aperture in the front face of the stile and is fixed in position by screws passing through the forend 17 and into the stile, in normal manner. Next, one of the end units, say the unit 2 as illustrated in
- 95 Fig. 5, complete with its drive bar 7, is taken and passed through another correctly positioned aperture in the front face of the stile so that the bar 7 extends along the inside of the stile and reaches into the vicinity of the central unit 1. It will be appreciated that by virtue of the connection of the drive bar 7 into the unit 2, passing over the pin 31, the bar 7 can be pivoted relative to the rest of that unit when feeding it down through the stile, so that the aperture in the stile required for the insertion of the unit, including the drive bar, need not be significantly taller than the height of the casing 22.
- 100

- As seen in Figs. 2 and 5, the free end of the bar 7 is formed with a clevis 34. There is also slidably mounted on the bar 7 a plastics moulding 35 having an integral spring finger 36 and an eye 37. When the unit 2 is offered into the stile the moulding 35 is positioned on the bar 7 as shown in Fig. 5 and in the upper part of Fig. 2, in which the mouth of the clevis 34 is left open, the moulding being retained in that position by the engagement of the finger 36 in a depression 38 in the bar surface (Fig. 2). In order now to connect the bar 7 from unit 2 to the central unit 1, a hooked implement is passed through an aperture 39 in the upper part of the forend 17 to pick up the eye 37 and pull the end of the bar 7 forwards so that the clevis 34 engages
- 105
- 110
- 115
- 120
- 125
- 130

over a pin 40 held between the slide plates 15. The moulding 35 is then pulled down along the bar 7 by use of the same implement until the spring finger 36 snaps behind the

5 shoulder 41 at the end of the bar, the moulding thereby closing the clevis 34 to prevent separation of the bar 7 from the pin 40 (ie as shown for the lower drive bar 7 from unit 3 in Fig. 2). This process is then repeated for

10 connection of the other end unit 3 to the respective pin 40. Throughout this process a dummy handle and spindle can be used in the corresponding follower 12 if required to position the plates 15 conveniently for engagement of the pins 40 with the clevises 34.

15 Having established the connection between the drive bars 7 and the central unit 1 the end units 2 and 3 can be fixed in place by screws passed through their forends 21 and into the

20 stile. Optionally, each of the forends 17 and 21 of the central and end units 1-3 can be covered by respective fascia plates 17A and 21A in the usual manner, the central fascia plate 17A then blanking off the forend apertures 39. The lock assembly is completed by

25 insertion of the proper spindle 9 and attachment of the door handles, and insertion and fixing of the lock cylinder in aperture 11, all in known manner.

30 It will be understood from the above that the assembly procedure for this lock does not need access through either end, or through the reverse face, of the door stile, but only through the front face for the main component

35 of units 1-3 and through the side faces for the spindle 9 and locking cylinder. This structure can therefore readily be assembled to, and removed from, an existing door without having to disassemble the door itself, even

40 partially.

CLAIMS

1. A multi-point lock in which a manipulable member is coupled to at least one remotely-located bolt through a reciprocable drive member, said bolt being comprised within a unit including mechanism for transmitting movement of said drive member to the bolt so that, when thrown, the bolt

50 projects transversely to the direction of the drive member, said mechanism including a pivotal member which, when said bolt is in its thrown position, lies in an "overcentre" position such that end pressure upon the bolt

55 tends to move that member further in the sense in which it moves when the bolt is being thrown, but such movement is limited by stop means.

2. A multi-point lock according to claim 1 wherein the remotely-located bolt is borne for reciprocation generally perpendicularly to said drive member and the said transmission mechanism comprises a first crank member borne at one end on a fixed pivot and coupled

65 at its other end to the bolt, and a second

crank member pivoted at one end to the first crank member and pivoted at its other end to said drive member, the second crank member being placed in an "overcentre" position as aforesaid when the bolt is thrown.

3. A multi-point lock according to claim 2 wherein the centre-to-centre distance between the connections of the second crank member to the first crank member and to the drive

75 member is substantially less than the centre-to-centre distance between the connections of the first crank member to said fixed pivot and to the bolt, and the point of connection of the second crank member to the first crank member lies on the first crank member intermediate its points of connection to the fixed pivot and to the bolt.

4. A multi-point lock according to claim 2 or claim 3 wherein the first crank member has an abutment against which the second crank member engages at a location remote from its pivotal connection to the first crank member when the drive member is moved in the sense to withdraw the bolt, to assist in the

90 transmission of motion to the first crank member in such sense.

5. A multi-point lock according to any preceding claim comprising a first unit adapted to be received within the stile of a door or like closure through an aperture in the front face thereof, and having a forend by which that unit can be fixed to such a face; said unit including an input member adapted to be operatively coupled to said manipulable member and an output member operatively coupled to the input member; and a second unit including said bolt and said drive member adapted to be received within the stile of a door or like closure through an aperture in the front face thereof at a location remote from the first

105 unit; the drive member extending away from the location of said bolt and being adapted to be operatively coupled at its free end to said output member of the first unit; and the aforesaid forend of the first unit having an aperture through which access can be gained to the free end of said drive member, when the first and second units are received as aforesaid, for coupling the same to said output member.

6. A multi-point lock according to claim 5 wherein said drive member has at its free end a clevis adapted to engage over a pin carried by said output member for coupling the drive member to the output member; and the drive member further carries a retainer adapted to close said clevis when engaged over said pin thereby to retain the drive member coupled to the output member.

7. A multi-point lock according to claim 6 wherein said retainer is slidably borne on the drive member and has a formation adapted for engagement by a hooked implement when inserted through said aperture whereby both to draw said clevis onto said pin and to slide the

130 retainer into its clevis-closing position.

8. A multi-point lock substantially as here-
inbefore described with reference to the ac-
companying drawings.

Printed in the United Kingdom for
Her Majesty's Stationery Office, Dd 8818935, 1986, 4235.
Published at The Patent Office, 25 Southampton Buildings,
London, WC2A 1AY, from which copies may be obtained.